Test Section File

REPORT

Weapons

of

The Infantry Board

No. 1460

GRENADE, HAND, OFFENSIVE, MARK III.

FORT BENNING, GEORGIA

March 16, 1943.

24725—Benning, Ga., 9-16-42—2,000

DECLASSIFIED
Authority NND 73503

IN-471.6

March 11, 1943.

SUBJECT: Grenade, Hand, Offensive, Mark III.

TO : Chief, Ground Requirements Section,
Army Ground Forces, Army War College,
Washington, D. C.

1. The Infantry Board concurs in the discussion and conclusions contained in Sections VI and VII of the attached report of test.

2. It is not believed that a requirement exists for the subject grenade in the Infantry because:

a. When used against personnel it is comparatively ineffective.

b. There is a better grenade for use against machine gun emplacements and similar installations (the AT rifle grenade).

c. The effective bursting radius of subject grenade is very small.

d. There are better means of destroying friendly and enemy materiel (standard demolition kits, flaming grenades, AT rifle grenades, or 2.36 rockets).

e. Concussion area is very small.

3. The Infantry Board recommends that no further consideration be given subject grenade for use by the Infantry.

For the President:

CHARLES H. [illegible],
Colonel, Infantry,
Acting Director.

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REPORT of TEST

GRENADE, HAND, OFFENSIVE, MARK III

TEST SECTION
THE INFANTRY BOARD
FORT BENNING, GEORGIA

Submitted to
THE INFANTRY BOARD

Copy No. 6 **Date** March 11, 1943.

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TEST SECTION
THE INFANTRY BOARD
FORT BENNING, GEORGIA

MARCH 11, 1943

SUBJECT: RE OUT OF TEST OF GRENADE, HAND, OFFENSIVE, ARK III.

TO: THE PRESIDENT, THE INFANTRY BOARD, FORT BENNING, GA.

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I AUTHORITY AND REFERENCES

1. Authority.

a. Letter, 471.6/231-GNR&T/14291, Ground Requirements Section, Hq., Army Ground Forces, August 22, 1942, with 1 indorsement. (Appendix "A")

2. References:

a. Letter, SPOKB-Prop, Anniston Ordnance Depot, September 8, 1942, (Appendix "B")

b. Infantry Board Reports of Test:

(1) No. 114, November 21, 1919.
(2) No. 137, September 14, 1920.
(3) No. 243, November 28, 1922.
(4) No. 297, August 20, 1923.
(5) No. 394, August 9, 1926.
(6) No. 416, July 8, 1927.
(7) No. 418, July 21, 1927.
(8) No. 464, March 28, 1929.
(9) No. 466, April 5, 1929.
(10) No. 469, May 11, 1929.
(11) No. 529, December 15, 1930.
(12) No. 531, February 5, 1931.
(13) No. 659, April 21, 1933.
(14) No. 1306, February 4, 1943.
(15) No. 1311, February 14, 1942.
(16) No. 1456, February 26, 1943.

II PURPOSE OF TESTS

3. a. To investigate and test the Grenade, Hand, Offensive, MkII/Al, to determine its possibilities for Infantry use:

(1) Against personnel.
(2) Against machine gun emplacements and similar installations.

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(3) For destruction of enemy materials.
(4) For destruction of friendly materials to prevent capture.

b. To determine its bursting radius and concussion (area affected).

III PERSONNEL

4. a. Major W. M. Myers, Infantry, Test Section, The Infantry Board, conducted the tests and prepared this report.

b. Photographs were taken by the Field Reproduction Plant, Fort Benning, Georgia.

IV INTRODUCTORY INFORMATION AND DESCRIPTION OF PROJECT TESTED

5. Introductory Information.

a. For history of development of the Offensive Hand Grenade see Appendix "A".

b. The test directive was received on August 27, 1942.

c. The initial lot of grenades and fuses were received on August 22, 1942. In letter, Appendix "B" below, the fuzes were declared suspended from issue and use until further notice.

d. Replacement fuses were received on January 2, 1943.

e. The test program was initiated on March 1, 1943.

6. Description of project tested.

a. The Grenade, Hand, Offensive, Mk IIIA1 is a cardboard cylinder of TNT into which is screwed fuze assembly M6A2.

b. The fuze, M6A2, is a standard bouchon type fuze. It has about a five second powder train into a detonator which closely resembles the commercial No. 8 detonator in appearance.

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a. See Test No. 1 for further details.

V DETAILS OF TESTS AND RESULTS

7. Test No. 1.
March 1, 1943.

a. Purpose: To determine the physical characteristics of the subject grenade.

b. Method: By weighing, measuring, and photographing.

c. Results:

(1) Measurements:

Length (height) overall	5.35"
Outside diameter	2.125"
Length of grenade, less fuze	4.4"

(2) Weights:

Loading assembly	0.66 lbs.
Fuze, M6A2	.21
Total assembly	0.87 lbs.
TNT content	.43 lbs.

(3) Appearance -- See Plates 1 and 2.

8. Test No. 2.
March 1, 1943.

a. Purpose: To determine whether the subject grenades are adequately waterproofed.

b. Method: Five grenades, with fuze assemblies in place, were placed in a tub of water and left there for 48 hours. At the end of that period they were removed and efforts made to actuate them.

c. Results: All grenades functioned perfectly.

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9. Test No. 3.
March 2, 1943.

a. Purpose: To determine the burning time of the fuze.

b. Method: Ten grenades were thrown. The time between the instant the grenade left the hand of the thrower and the instant it detonated was recorded.

c. Results:

(1) The average fuze time was 4.9 sec. Minimum time recorded was 4.3 sec.; maximum time was 5.4 sec.

(2) Weekly Directive No. 9, Headquarters Army Ground Forces, March 2, 1943, contains the following pertinent paragraph:

"9. SAFETY PRECAUTIONS FOR GRENADES, HAND, OFFENSIVE MK IIIA1.

a. Short burning time of fuzes, M6A2, for offensive hand grenades has been experienced. Shortest burning time was 1.5 second fuze. This makes it unsafe to hold the grenade after the striker has flipped over as is being done by some troops. This practice will be discontinued when using the M6A2 fuze."

10. Test No. 4.
March 2, 1943.

a. Purpose: To determine the effect of heat and cold on the subject grenades.

b. Method: Ten grenades were placed in a cold storage chamber at a temperature of 10°F. and left for 24 hours. Ten grenades were placed in a laundry drying room at a temperature of 130°F. and left for a period of 24 hours. Efforts were then made to detonate the grenades.

c. Results: All grenades functioned perfectly. It was believed that two of the grenades which had been placed in the hot room had short fuzes. This item was, however, not checked by stop watch.

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11. Test No. 5.
March 3, 1943.

a. Purpose: To determine the most satisfactory method of throwing the subject grenade.

b. Method: An experienced grenadier and a man who had never thrown hand grenades were used in this test. Various methods of throwing were tried. The more satisfactory ones were selected for further tests of accuracy and distance.

c. Results:

(1) Three methods of throwing the grenade were found to be effective. These were: (1) Underhand, as a soft ball; (2) overhand as a baseball; (3) like the Mk II fragmentation grenade as shown in FM 23-30.

(2) Greatest accuracy was obtained when the grenades were thrown underhand.

(3) Greatest distance was obtained when the grenades were thrown as a baseball.

12. Test No. 6.
March 3, 1943.

a. Purpose: To compare the accuracy and distance which can be obtained using the subject grenade with that obtained using the Mk II fragmentation grenade.

b. Method: Two soldiers, one an experienced grenadier, the other relatively inexperienced, were used in this test. Both threw ten grenades of each type at targets 20 and 30 yards away from their position for the accuracy test. Both threw ten grenades of each type for maximum distance.

c. Results:

(1) Accuracy:

(a) The defensive hand grenade (MkII Fragmentation) can be thrown more accurately than the offensive (subject) grenade. The latter bounces and rolls after impact much more than does the MkII. The direction in which the grenade will bounce is unpredictable; therefore allowances cannot be made for it.

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(b) The fragmentation grenade, because it fits the hand better, is more easily thrown accurately.

(2) Distance:

(a) Offensive grenade.--The inexperienced grenadier obtained an average range of 57.6 yards, the experienced grenadier an average range of 54.3 yards.

(b) Defensive grenade.--The inexperienced grenadier obtained an average range of 49.9 yards, the experienced grenadier an average range of 56.2 yards.

(c) Neither grenade appears to have an outstanding advantage in range.

(d) Since the purpose of the offensive grenade is to provide a grenade which can be safely thrown by advancing troops the maximum range is an unimportant consideration.

(3) On a comparative basis, the defensive grenade can be thrown more accurately than the offensive; the maximum distance to which each can be thrown is approximately the same.

13. Test No. 7.
March 3, 1943.

a. Purpose: To determine the effect of blast upon personnel.

b. Method: TNT blocks weighing 0.43 lbs. were exploded on a steel plate while the test officer moved in from 20 yds. to 2-1/2 yds. from the point of the explosion. The effects of the concussion were noted.

c. Results:

(1) Table:

Distance from Pt. of Burst	Effect of Concussion
20 yds.	None.
15 yds.	None.
10 yds.	None.

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7½ yds.	Made ears ache.* Felt blast slightly.
5 yds.	Felt blast strongly. Since ears were plugged no comment can be made on effect.
2½ yds.	Officer received a thorough shaking up; however no ill effects were noted. Ear drums would undoubtedly have been injured had the ears not been plugged.

* Ear plugs were used for closer blasts.

(2) It was concluded that the effect of blast on personnal in the open is inconsequential at distances greater than 3-1/2 yards.

14. Test No. 8.
March 5, 1943.

a. Purpose: To determine the effect of the subject grenade on a machine-gun emplacement.

b. Method: A machine-gun emplacement was dug according to instructions contained in FM 23-55. Two cardboard figures were placed therein. Grenades were thrown in the emplacement and the effect noted.

c. Results:

(1) The first grenade fired blew the right cardboard figure completely apart. The cap and bouchon pierced the second figure. It was concluded that both would have been casualties.

(2) The second grenade fired also blew the right cardboard figure (which had been replaced) completely apart. No damage was done the left figure.

(3) It was concluded that the subject grenade, if thrown into emplacements or foxholes, would produce casualties.

15. Test No. 9.
March 5, 1943.

a. Purpose: To determine the fragmentation effect of the subject grenade.

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b. Method: A panel enclosure was constructed of 8' x 10' panels. Panels were of 3/4" pine. Two panels, subtending an arc of 135° were placed 2-1/2 yards from the point of detonation. Two panels, subtending an arc of 75° were placed 5 yards from the point of detonation. Two panels, subtending an arc of 50° were placed 7-1/2 yards from the point of detonation. Two panels, subtending an arc of 37.5° were placed 10 yards from the point of detonation. The enclosure was completed with target cloth. The grenades were exploded and a count of penetrations and perforations made after each firing.

c. Results:

(1) Table.

Shot	Position of Grenade	2½ yd. Panel Pen.	2½ yd. Panel Perf.	5 yd. Panel Pen.	5 yd. Panel Perf.	7½ yd. Panel Pen.	7½ yd. Panel Perf.	10 yd. Panel Pen.	10 yd. Panel Perf.
1	Upright	3	2	3	0	6	0	2	0
2	Upright	8	0	5	0	12	0	1	0
3	Pointed at 2½ yd. panel	14	1	4	0	13	6*	4	1
4	Pointed at 5 yd. panel	1	0	6	2	1	4	3	0
	Average	6.5	0.75	4.5	0.5	8	2.25	2.5	0.25

* Metal base of grenade pointed toward this panel.

(2) It is evident that the danger area of this grenade is in excess of 10 yards. It is the opinion of the test officer that it is as great as that of the Mk II fragmentation grenade, since the much higher velocity of the TNT filler will cast the fragments of the base and cover at least as far as the DC powder will cast the fragments of the latter grenade.

(3) It was noted that the metal base and cover caps and the fuze were broken up into a large number of very small particles. It appears extremely probable that the number of fragments will approximate those obtained from the DC grenade.

(4) Pieces of the fuze and of the covers were picked up 30 yards from the point of detonation.

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16. Test No. 10.
March 6, 1943.

a. Purpose: To determine the effectiveness of the subject grenade as a demolition agent for use on material.

b. Method: By study.

c. Results:

(1) The explosive used in the subject grenade is TNT. Actual weight of the TNT is 0.43 lbs. The explosive is molded in the form of a cylinder. Therefore, some loss of power is experienced if more than one grenade is needed for the demolition contemplated since the cylindrical grenades cannot be packed as well as the standard demolition blocks.

(2) It is estimated that the subject grenade would be approximately four-fifths as effective as one one-half pound block of TNT in demolitions work.

(3) It is understood that complete records exist showing the amount of TNT needed for various types of demolitions work. Using the ratio given above, the effectiveness of the subject grenade for this type of work could be quickly determined.

(4) Permission to destroy various items of equipment in actual tests of the subject grenade as a demolitions agent could not be secured.

VI DISCUSSION

17. General.--a. The offensive hand grenade was designed to provide a grenade which could be thrown short distances without endangering a thrower who is not protected by cover of any kind. Therefore in order to be effective the grenade must be thrown quite close to enemy personnel, or into trenches, foxholes or emplacements. In contrast, the fragmentation grenade, MkII, was designed to be used from covered positions against personnel in the open. In current practice, this grenade has fulfilled the functions of both the offensive and defensive grenade.

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b. Definitions.—For purposes of clarity, the following meanings are used herein for the rather ambiguous terms indicated:

(1) Bursting radius - derived from danger area: that distance at which an individual might be injured thru action of the grenade or parts of the grenade.

(2) Effective radius — The radius of the circle within which any individual not covered would be an almost certain casualty.

18. Safety.—The subject grenade does not fulfill its purpose of providing reasonable safety for a thrower who is not protected by cover of any kind.

a. Reference to Test No. 9 will show that pieces of the base and cover, and pieces of the fuze assembly are thrown with sufficient velocity to penetrate 3/4" pine boards at distances up to ten yards, and that pieces of these elements were picked up 30 yards from the point of detonation.

b. Reference to Letter, Appendix "B", and to the excerpt from Army Ground Forces Weekly Directive quoted in Test No. 3 show that the fuze M6A2 is not satisfactory from the standpoint of safety.

19. Effectiveness.—The subject grenade is relatively ineffective as a casualty producing agent. Its principal value is considered to be one of morale, altho if used in trenches, foxholes, or emplacements, it would undoubtedly produce some casualties.

a. Test No. 7 indicates that the subject grenade has insufficient blast effect to injure personnel in the open at distances of more than 2-1/2 yards. The subject grenade cannot be thrown accurately enough to insure hits within that radius.

b. Test No. 8 indicates that the grenade would probably be effective against personnel in emplacements. The principal danger of the grenade is not from blast, but from the fragments of metal parts which might strike personnel.

c. Test No. 9 shows that the density of fragmentation to be insufficient to be considered effective. The fact that the

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grenade is dangerous within a radius of over 25 yards is not in contradiction to the above statement. Basing effectiveness on one hit per square yard of surface, it can be shown mathematically that the effective radius of the offensive grenade is less than two and one-half yards.

30. Use as a demolitions agent.—Since the explosive used in the subject grenade is TNT it is evident that it would be a useful demolitions agent. Authority to actually test the grenade on materiel could not be secured. Study indicates that it would be approximately four-fifths as effective as the standard one-half pound block of TNT. Except for the destruction of heavy weapons and mortars, other means, such as fire or use of an axe, would probably be as effective.

31. Comparison of subject grenade with the grenade, hand, fragmentation, Mk II.—The following table of grenade characteristics gives a brief comparison between the offensive and defensive hand grenades:

Characteristic	Superior grenade Mk II	Mk III	Equal
1. Accuracy with which grenade can be thrown	x		
2. Distance to which grenade can be thrown			x
3. Safety to thrower			x
4. Effectiveness against personnel in the open	x		
5. Effectiveness against personnel in foxholes, etc.			x
6. Effectiveness against materiel		x	

32. Summary.

a. The subject grenade possesses the following advantages:

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(1) It is waterproof.

(2) It will produce casualties among personnel in foxholes or emplacements.

(3) It can be used as a demolitions agent.

b. The subject grenade possesses the following disadvantages:

(1) Its blast has little effect on personnel in the open.

(2) Its fuze is sensitive and its burning time undependable.

(3) Its danger area is excessively large.

(4) It bounces badly upon impact, thereby decreasing accuracy.

(5) It must be shipped unfused.

VII CONCLUSIONS

23. The Test Section concludes:

a. That the subject grenade has a bursting radius (danger zone) of approximately 30 yards.

b. That the area affected by concussion, in the open, is less than 2-1/2 yards in radius.

c. That the grenade is ineffective against personnel in the open.

d. That the grenade is effective when fired in emplacements.

e. That the grenade is approximately four-fifths as effective as the standard one-half pound block of TNT for demolitions purposes.

H. G. SYDENHAM,
Colonel, Infantry,
Chief of Test Section.

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APPENDIX

I-471.5
(8-7-42)

1st Ind.

Hq 2d Bn 8 R.C.T., Fort Benning, Georgia, August 26, 1942.
To: The Chief of Test Section, The Infantry Board.

1. This is sent in accordance with paragraph 4 of basic letter.

For the President:

J. F. Smith,
Lt. Col., Infantry,
Acting Recorder.

4 incls. n/c.

AFRD [illegible] "A"

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Ground Requirements Section
Headquarters
[illegible]
Army War College
Washington, D.C.

471.6/[illegible]

August 27, 1942.

Subject: Grenade, Hand, Offensive, Mark III.

To: The President, The Infantry Board,
Fort Benning, Georgia.

1. Reference letter this headquarters [illegible]
subject as above, dated May 27, 1942, relative to the standardization of the Grenade, Hand, Offensive, Mark III, and 1st Indorsement, your headquarters, file [illegible]-471.6 (5-27-42) dated June 5, 1942 suggesting basis of issue of subject grenade.

2. Fifty Grenades, Hand, Offensive, Mark III have been allocated to the Infantry Board. This headquarters has been informed that the Mark III Grenade has been declared obsolete and that the Mark III A1 is now being procured. The Mark II Grenade was originally developed in 1918 but was never issued. However at the request of the Chief of Infantry for an offensive grenade it was revived. For technical reasons, certain modifications were necessary and after they were incorporated the grenade was redesignated Mark III A1.

3. Drawings covering details of subject grenade are forwarded for your information. When throwing the offensive grenade Mark III A1, care must be taken to see that all personnel are at least 60 yards from where the grenade is to be thrown. The area in which the throwing is to take place should be clear of entangled wires, tree limbs, and other overhead obstruction. The detonator of the fuze M42 is very sensitive to heat, shock and friction. Therefore it must be handled with extreme care at all times.

4. Upon receipt of these grenades, it is directed that you investigate and test its possibilities for Infantry use. Your tests will include the following:

a. Use against personnel.
b. Use against Machine Gun emplacements and similar installations.

[illegible]

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[illegible]urating [illegible]edius.
[illegible]. Use in destruction of enemy materials.
[illegible]. Use in destruction of friendly materials to prevent capture.
[illegible]. Concussion (Area affected).
[illegible]. Such other test that you deem necessary.

By command of Major General [illegible]:

/s/ [illegible]
[illegible]
Lt. Colonel, [illegible],
Executive,
Ground Requirements Section.

[illegible].
[illegible].

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a. [illegible]urating [illegible]adius.
b. Use in [illegible]estruction of enemy [illegible]aterials.
c. Use in destruction of friendly materials to prevent [illegible]apture.
d. [illegible]onclusion (Area affected).
e. Such other test that you deem necessary.

By command of [illegible]ajor General [illegible]:

/s/ [illegible]. [illegible]. [illegible]eam
[illegible]. [illegible]. [illegible]AM,
[illegible]t. [illegible]olonel, [illegible]. [illegible]. [illegible].,
[illegible]xecutive,
[illegible]round [illegible]equirements [illegible]ection.

[illegible]
[illegible]evised.

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Authority NND 73[illegible]

WAR DEPARTMENT
Anniston Ordnance Depot
Alabama

Post Office
Anniston, Ala.

SPOKE-Prop
MCCONVILLe/as

Rail and Express Station
Bynum, Ala.

September 8, 1942.

SUBJECT: Suspension of Fuzes from Issue and Use.

TO: Ordnance Property Officer,
Fort Benning, Ga.

1. In accordance with Teletype No. 37409, dated September 4, 1942 and Teletype No. 34515 dated September 7, 1942 from the Office of the Chief of Ordnance, this depot wishes to advise that Fuze, Detonating, Hand Grenade, M6A2 from Paragon Manufacturing Co., New Derry, Pa., Lot 64-23114-5, be suspended from issue and use until further notice.

2. Shipment of 50 each above fuzes was made to your station on Bill of Lading 7217830, in Car NC & STL 20490. Said shipment was covered by Shipping Order 3025-S-2 on Shipping Ticket 1321-43. Date shipped was August 11, 1942.

3. It is requested that consignees be advised of this suspension.

For the Commanding Officer:

/s/ E. F. CUNNINGHAM,
Capt. Ord. Dept.,
F. S. Prop. Officer.

COPY

APPENDIX "B"

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Grenade, Hand offensive MKIIIA1

Complete Unit.

PLATE 1

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Grenade, Hand, Offensive, MKIIIA1

a. Grenade body.

b. Fuse M6A2.

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